

# PNW River Reach File Documentation

## Usage Note:

**This theme has been modified to be in the Oregon Lambert Projection. The most up to date theme, including all data fields is located at [www.streamnet.org](http://www.streamnet.org)**

Updated August 2001

These files incorporate changes and corrections to the 100k Reach Files originally posted on this site in the fall of 1997. Numerous routing errors have been corrected, flow direction of routes and arcs has been made consistent, and attribute miscodes have been addressed. In addition, the files maintained by WDFW, IDFG, and ODFW have been made consistent, especially in the hucs along the state borders. All of the LLIDs in these coverages have been approved by the state fish and wildlife agencies, and will be kept unchanged unless compelling reasons necessitate updates. Some routes may have LLIDs different than those posted in earlier versions, but every effort has been made to minimize this as much as is practical. Archival versions of the previous reach files can be made available to help in any updates to event data or other databases using the LLID attribute. Please contact [StreamNetGIS@psmfc.org](mailto:StreamNetGIS@psmfc.org) if you have any questions.

Streamnet would also like to recognize the people who managed the work done to these files at the state level, without who's help and patience this database wouldn't have been possible.

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## 1. Introduction

The U.S. Geological Survey (USGS) in Portland, in cooperation with Bonneville Power Administration, the Northwest Power Planning Council, and other Federal and state agencies and NW Indian Tribes produced a 1:100,000-scale River Reach data layer for the Pacific Northwest in the early 1990s. The Pacific Northwest (PNW) River Reach Files are a geo-referenced river reach data layer that encompasses the Columbia River

Basin within the conterminous United States, the coasts of Oregon and Washington, Puget Sound in Washington, the Klamath and Goose Lake Basins in southern Oregon and the Bear Lake Basin in southeastern Idaho. The system is basically a 1:100,000 scale enhancement of the pre-existing 1:250,000 scale EPA River Reach File 2 (RF2).

This process was a primary task of the PNW River Reach Project because these reach identifiers are an integral hydrologic component in a regional rivers and fisheries information system now known as StreamNet (formerly the Coordinated Information System (CIS) and the Northwest Environmental Database (NED)). StreamNet is an ongoing effort by federal, state, and tribal organizations within the region to compile reach and stream specific information pertinent to the Region's fish and wildlife resources in Oregon, Idaho, Washington, and Montana. The PNW Reach Files carry the U.S. Environmental Protection Agency's (US EPA) river reach numbers. The system was transferred over to the StreamNet project at Pacific States Marine Fisheries Commission (PSMFC) in early 1997 for maintenance, enhancement, and distribution. PSMFC is also the lead contractor responsible for supervising the integration and conversion of the PNW Reach Files into the new National Hydrography Dataset. This particular version contains only the streams in Oregon and its overlapping HUCs. It was provided to the OGDC by the Oregon Department of Fish and Wildlife.

**1.1 Methodology** The PNW River Reach Files were constructed using ARC/INFO versions 4.0 and 5.0. A unique conflation algorithm was developed by the USGS that transferred the reach identifiers from the RF2 to the new 1:100,000-scale hydrography. The 1:100,000-scale hydrography were constructed from scanned 1:24,000 and 1:63,000-scale separates and then edited. Most, but not all hydrographic features found on these two larger scale products will be found in the PNW Reach Files. The PNW Reach Files are a linked stream network. ARC: NETWORK utilities were used on the Reach Files to provide attribute information that would allow a user to perform directional routing upstream or downstream from a given starting point using either a GIS or by using items, such as UPLINK1, 2,3 PNTR# and DOWNLINK found in the Arc Attribute Table. Water body features such as lakes, reservoirs, defined wetlands, double-banked streams, and others were moved to a separate 'banks' coverage and represented in the Reach File with centerlines and tributary connectors arcs. Reach files are organized by USGS hydrologic unit codes (HUCs - also known as cataloging units) and are designed to provide users with a 1:100,000-scale reach structure for performing various types of hydrologic applications. Every reach in the Reach File has been assigned a unique but stable reach identifier (17 character river reach number comprised of the 8 digit HUC, the 4 digit segment number (SEG), and the 5 digit reach mile point). New reaches in the system were numbered starting with SEG = 500 providing a unique way to locate all new arcs in the system. The following is a generalized list of procedures followed to construct the PNW River Reach Files. The USGS Open File report mentioned in the .DOC will include all of the processing macros written to assist in the Reach File development.

Generalized procedures for constructing 100K scale Reach Files

1. Read 100K hydrography DLGs for each map into GIS.
2. Edgematch north and west edges of each map to adjacent 100K quads.
3. CLIP each 100K quad with adjusted Hydrologic Unit boundary.
4. APPEND clipped quad pieces together.
5. Correct internal node errors using automated snapping.
6. Remove non-attributed pseudo nodes.
7. Copy polygons to Waterbody coverage.
8. Edit out double-banked streams, shorelines, and braided areas and put into Water bodies coverage.
9. Add centerlines through waterbodies and wide streams and connector arcs from centerlines to tributaries.
10. Create Trace coverage from EPA Reach File.
11. Edit Trace, correcting stream names and topologic structure where
12. Adjust Trace segment endpoints to align with corresponding 100K endpoint.
13. CONFLATE (Transfer) Trace-ID from Trace reaches to corresponding reaches in 100K coverage.
14. Make check plots to verify results of conflation.
15. Transfer EPA extended attributes (SEG, LEVEL, SEQNUM, FLAG) to 100K reaches.
16. Assign unconflicted 100K reaches a provisional reach code.
17. Move provisional codes to SEG.
18. Add State, County, and quad boundary items to reaches in 100K-scale Reach File.
19. Compute sinuosity for each reach.
20. Block man-made waterways, braided reaches, and other features determined as not part of the basin network by calculating their LENGTH item to negative.
21. Determine allocation centers. Usually mouth of basin.
22. ALLOCATE from centers.
23. WRITEALLOCATION ROUTING results to Reach File Arc Attribute Table.
24. Use DIRECTION item to flip reaches to flow in a downstream direction
25. Calculate PNTR# to internal record number of Arc Attribute Table
26. Unblock previously blocked arcs.
27. Calculate river mile for allocated reaches.

28. Compute upstream linkage. INFO program.
29. Order attributes in Reach Files and Water bodies coverage for consistency among Files.
30. Check Reach File using checking programs.
31. Manually add Northwest Power Planning Council reach codes, stream names and river miles.
32. Run final check programs
33. Archive Reach Files.
34. Distribute to states for review.

## 1.2 New Features

PSMFC has, via the StreamNet project, made several major enhancements in the PNW River Reach file which are now incorporated in the system. The major enhancement has been the addition of a new attribute which allows for the development and use of a *stream based* routing system.

The impetus and methodology for deriving the new *stream based* identifier was developed by an interagency committee that was formed under the President's 1993 Forest Plan. The Interorganizational Resource Information Coordinating Council (IRICC), comprised of representatives from federal, state, tribal, and local entities, was tasked with developing data standards that could be used across agency boundaries that would facilitate implementation of the Forest Plan. They recognized that for stream related data, a comprehensive and regionally standard hydrologic system was necessary to ensure that data could be readily collected and shared between agencies. They further recognized that the utility of such a system would be greatly enhanced if a method for identifying a given *stream* within the hydrologic coverage was available. After looking at the various options available in the region, the IRICC group officially adopted the PNW Reach File system as the base hydrologic layer and developed a new attribute called the Longitude/ Latitude ID (LLID) for use in uniquely identifying *streams*. This attribute consists of the longitude and latitude of the mouth of the stream. All *reaches* (or arcs) that comprise a given *stream* were to be assigned a unique LLID. Longitude would precede latitude to conform with standard x,y ordering. The code will be 13 characters long, with 7 for decimal degrees of longitude and 6 for decimal degrees of latitude, with implied decimal points.

After the IRICC decision, a fast track effort was put in place to add the new LLID field to the PNW Reach File and this effort is largely complete (all streams in OR and WA, all named streams in ID and MT). In the PNW Reach File a *stream* is defined a series of contiguous arcs comprising a waterway with identical values in the FEAT\_NAME field. Only arcs representing the transport path of water (stream, braided stream, some canals, and centerlines and connector arcs within lakes and reservoirs) with a SAVENEG value of NO were included. For features that were unnamed, stream ID's were applied visually using best professional judgment.

StreamNet has used the new LLID as the basis for building a regionally consistent stream routing system. By using this routing system, one can exploit the benefits of ArcInfo's dynamic segmentation, including the use of *event tables* for data collection and sharing. We believe this is a significant enhancement to the reach file which will greatly facilitate its use.

### *1.3 Descriptors:*

River Reach File, Hydrography, Catalog Unit, Hydrologic Unit, 100K-scale, LLID

## **2. PNW Reach File Applications**

### *2.1 Intended use of data*

Many different types of GIS analysis can be performed on the Reach Files. These might include buffering around reaches, stream network routing, basin characteristics analysis or dynamic segmentation. Furthermore, the system provides an ideal environment for storing, organizing, and displaying stream related fisheries and habitat data.

### *2.2 Limitations of data*

The PNW River Reach Files were compiled from 1:100,000-scale Digital Line Graphs for hydrography, which were constructed from scanned 1:24,000 and 1:63,000-scale separates and then edited. The county boundaries coverage was at 1:500,000-scale. This lower resolution may have caused some reaches to be incorrectly coded for COUNTY and COUNTY-2. Not all stream reaches have been named. None of the water body features were named or coded with a unique identifier. Stream ID's (LLID) have only been assigned to named streams in Oregon, Washington, Idaho, and Montana, and unnamed streams in Oregon and Washington.

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### **Map projection parameters for PNW Reach Files:**

PROJECTION LAMBERT

UNITS INTERNATIONAL FEET

DATUM NAD83

SPHEROID GRS1980

1st Standard Parallel	43 00 0.000
2nd Standard Parallel	45 30 00
central meridian	-120 30 0.00
lat org	41 45 0.00
easting (meters)	400000.00000 (1,312,355.958 Feet)
northing (meters)	0.0